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| 10/518,825 | 12/21/2004 | Peter Klaus Bachmann | DE020166US | 3595 |

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| EXAMINER |
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WOLDEKIDAN, HIBRET ASNAKE

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| ART UNIT | PAPER NUMBER |
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2613

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07/25/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/518,825

Applicant(s)

BACHMANN ET AL.

Examiner

Hibret A. Woldekidan

Art Unit

2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period **will** apply and **will** expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply **will**, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Response to Arguments

1. Examiner acknowledges receipt of Applicant's Amendments, remarks, arguments received on 6/05/08. Claims 16,18 have been amended. Applicant's arguments filed on June 05, 2008 have been fully considered but they are not persuasive.

Applicants argument with regard to Claim 1 is moot in light of the new ground of rejection.

With regard to Claim 16, applicants argued on Page 12 that Brennan in fact shows a max peak in the 780nm range.

Claim 16 places particular emphasis on wavelengths 600-700nm within the range of wavelengths. The claim further states that a maximum intensity is reached at wavelengthe between 600nm-700nm.

In fig. 2 of Brennen, an intensity maximum(Peak) occurs at 660nm. Notice in fig. 2 that none of the other peaks at 742nm, 813nm exceed that of the peaks at 660nm intensity. Hence it is a fair argument that the intensity of emitted light reaches a maximum at a wavelength between 600nm and 700nm. A maximum intensity is the same as a peak intenisty.

With regard to Claim 17, Fig. 2 of Brennen clearly shows that the graph is a non-linear.(See abstract)

Claim Rejections - 35 USC § 102

Art Unit: 2613

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

1. Claims 16, 17 are rejected under 35 U.S.C. 102(a) as being anticipated by Brennan ME et al.; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant"

Considering Claim 16, Brennen teaches an optical device comprising at least one photoluminescent carbon nanotube configured to emit, in response to an input of electromagnetic radiation, light over a range that includes wavelengths from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that the photoluminescent carbon nanotube emits light over the range 600-700 nm.)**, wherein an intensity of emitted light reaches a maximum at a wavelength greater than or equal to 600 nm and less than or equal to 700 nm **(See Page 59 section 3.1, Paragraph 2 , fig. 2 i.e. the intensity or energy of the emitted light reaches a maximum or peak at 660 nm which is at a wavelength range of 600-700 nm).**

Considering Claim 17, Brennen teaches the optical device of Claim 16 wherein the wavelengths vary non-linearly with intensity of the electromagnetic radiation **(See page 57 section 1.5, Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that the photoluminescent carbon nanotube intensity vary non-linearly with the intensity of the electromagnetic radiation).**

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5,10-15,21 are rejected under 35 U.S.C. 103(a) as being unpatentable over BRENNAN ME. ET.AL; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Frankel (6,096,496)

Considering claim 1 Brennan discloses electromagnetic radiation with a variable intensity(**See abstract page 56, Section 1.4 Page 57, fig. 2 i.e. fig. 2 illustrates that electromagnetic radiation with variable intensity**), an optical component(**See Section 1.1 page 56, i.e. carbon nanotube is an optical component**), the optical component comprising at least one photoluminescent carbon nanotube configured to emit light at wavelengths varying non-linearly with the intensity of said light (**See Section 1.4, page 57, fig. 2 i.e. the optical component is photoluminescence carbon nanotube that has a non linearly varying intensity**) and further comprising a means of detecting electromagnetic radiation(**See abstract, page 57 paragraph 5 i.e. absorbance of nonlinear photoluminescence in carbon nanotubes**).

Brennen does not explicitly show an optical signal processing device equipped with a source of electromagnetic radiation.

Frankel teaches an optical signal processing device equipped with a source of electromagnetic radiation of variable intensity (**See Col. 15 line 40-44, Col. 34 line 60-67 i.e. Electromagnetic light source or laser emitting electromagnetic radiation with a variable intensity**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and show an optical signal processing device equipped with a source of electromagnetic radiation of variable intensity, as taught by Frankel, thus providing a device that transmits by distinctly emitting a variable intensity of light, as discussed by Frankel (**See Col. 5 lines 35-38**).

Considering claim 2, Frankel teaches the optical signal processing device of claim 1, wherein the optical component comprises a substrate and a layer having a number of photoluminescent structure (**See Col. 17 line 53-67, Col. 26 line 7-28 i.e. a Laser comprising a substrate and a photoluminescent emitting structure**).

Considering claim 3, Frankel teaches the optical signal processing device of claim 2, wherein the non-linear optical component further comprises an intermediate layer between substrate and the layer having a number of photoluminescent structure (**See Col. 26 line 7-27 and line 44-55, Fig. 15, Fig 16 i.e. a wave guide between the substrate and a layer having a photoluminescent structure**).

Considering claim 4, Frankel teaches an optical signal processing device of claim 1, wherein the electromagnetic radiation is monochromatic coherent laser light (**See Col. 19 lines 35-50, Col. 32 line 41-51 i.e. monochromatic coherent laser light which is a single wave length**).

Considering claim 5 Brennen discloses an optical component having at least one photoluminescent carbon nanotube having wavelengths varying non-linearly with the intensity of said light **(See abstract, page 57 section 1.5, Page 59 section 3.1, fig. 2 i.e. non linear variation of wavelength versus intensity of photoluminescence carbon nanotubes)**.

Brennen does not explicitly show an optical signal processing device equipped with a source of electromagnetic radiation.

Frankel teaches an optical signal processing device equipped with a source of electromagnetic radiation of variable intensity **(See Col. 15 line 40-44, Col. 34 line 60-67 i.e. Electromagnetic light source or laser emitting electromagnetic radiation with a variable intensity)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and show an optical signal processing device equipped with a source of electromagnetic radiation of variable intensity, as taught by Frankel, thus providing a device that transmits by distinctly emitting a variable intensity of light, as discussed by Frankel **(See Col. 5 lines 35-38)**.

Considering Claim 10, Brennen discloses the optical component of claim 5, wherein the at least one photoluminescent carbon nanotube emits light at wavelengths over the range from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that photoluminescent carbon nanotube emitting light over the wavelength range of 600-700 nm)**.

Considering Claim 11, Brennen discloses the optical component of claim 10, wherein the wavelength varying non-linearly with the intensity of said light reaches a maximum at a wavelength in the range from 600 to 800 nm **(See Page 59 section 3.1, fig. 1 i.e. fig. 1 illustrates that photoluminescent carbon nanotube reaches a maximum intensity over the range of wavelength range of 600-800 nm).**

Considering Claim 12, Brennen discloses the optical signal processing device of claim 11, wherein the wavelength varying non-linearly with the intensity of said light reaches a maximum at a wavelength in the range from 600 to 700 nm **(See Page 59 section 3.1, Paragraph 2, fig. 2 i.e. the intensity or energy of the emitted light reaches a maximum or peak at 660 nm which is at a wavelength range of 600-700 nm).**

Considering Claim 13, Brennen discloses the optical signal processing device of claim 1, wherein the at least one photoluminescent carbon nanotube emits light at wavelengths over the range from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates photoluminescent carbon nanotube emits light at wavelengths over the range of wavelength range of 600-700 nm).**

Considering Claim 14, Brennen discloses the optical signal processing device of claim 13, wherein the wavelength varying non-linearly with the intensity of said light reaches a maximum at a wavelength in the range from 600 to 800 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that the wavelength vary non linearly with the intensity and the photoluminescent carbon nanotube the intensity reaches a maximum over the range of wavelength range of 600-800 nm).**

Considering Claim 15, Brennen discloses the optical signal processing device of claim 14, wherein the wavelength varying non-linearly with the intensity of said light reaches a maximum at a wavelength in the range from 600 to 700 nm **(See Page 59 section 3.1, Paragraph 2 , fig. 2 i.e. the intensity or energy of the emitted light reaches a maximum or peak at 660 nm which is at a wavelength range of 600-700 nm).**

Considering Claim 21, Frankel teaches the optical device of claim 16, wherein the electromagnetic radiation is monochromatic coherent laser light **(See Col. 19 lines 35-50, Col. 32 line 41-51 i.e. monochromatic coherent laser light which is a single wave length).**

3. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over BRENNAN ME. ET.AL; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Frankel (6,096,496) further in view of Lieber (7,129,554).

Considering claim 6, Brennen and Frankel do not specifically disclose the optical component of claim 5, wherein the carbon nanotube has a thin film coating
Lieber teaches the optical component of claim 5, wherein the carbon nanotube has a thin film coating **(See Col. 5 line 54-57 i.e. the carbon nanotube has a thin film coating).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen and Frankel, and modify the

Art Unit: 2613

carbon nanotube to have a thin film coating, as taught by Lieber, thus providing efficient transport of charge carrier and excitations, as discussed by Lieber **(Col. 1 lines 21-25)**.

Considering claim 7, Lieber teaches the optical component of claim 5, wherein the carbon notube is embedded in a non-oxidizing matrix **(See Col. 11 line 6-38 i.e. buffer gas as a non-oxidizing matrix)**.

Considering claim 8, Lieber teaches the optical component of claim 5, wherein the carbon nanotube is embedded in a non-oxidizing matrix, which is transparent for electromagnetic radiation **(See Col. 16 line 15-20, Col. 25 line 38-43, Col. 11 line 6-38 i.e. glass which is non-oxidizing and transparent material)**.

Considering claim 9, Lieber teaches the optical component of claim 5, wherein the carbon nanotube is embedded in a non-oxidizing, flexible matrix **(See Col. 16 line 15-20, Col. 25 line 38-43, Col. 11 line 6-38 i.e. glass which is non-oxidizing and transparent material i.e. buffer gas as a non-oxidizing matrix)**.

4. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brennan ME et al.; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Bogner et al. (6,649,946).

Claim 18 Brennen does not specifically disclose the optical device of Claim 16 wherein the intensity of emitted light only decreases after the maximum intensity.

Bogner teaches the optical device of Claim 16 wherein the intensity of emitted light only decreases after the maximum intensity **(See fig. 2, Col. 4 lines 13-17, i.e.**

illustrates that the maximum intensity reaches between 600 and 700 nm and the intensity of emitted light decreases only after it reaches a maximum).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and have the intensity of emitted light only decreases after the maximum intensity, as taught by Bogner, thus providing a stabilized light emitting device that operates in high temperature for emitting a high color radiation, as discussed by Bogner **(Col. 2 lines 10-15)**.

5. Claims 19,20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brennan ME et al.; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Lee et al. (6,514,113).

Considering Claim 19, Brennen discloses a photoluminescent carbon nanotube**(See abstract)**.

Brennen does not explicitly show the optical device of claim 16, wherein the at least one photoluminescent carbon nanotube is comprised in a component including a substrate and a layer on the substrate comprising the at least one photoluminescent carbon nanotube.

Lee teaches the optical device of claim 16, wherein the at least one photoluminescent carbon nanotube is comprised in a component including a substrate and a layer on the substrate comprising the at least one photoluminescent carbon nanotube **(See Col. 4 line 20-35, Fig. 1 i.e. fig. 1 illustrates that carbon nanotubes**

comprised in a component including a substrate (element 100) comprising a number of carbon nanotubes (element 400)).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and have the photoluminescent carbon nanotube to be comprised in a component including a substrate and a layer on the substrate comprising the at least one photoluminescent carbon nanotube, as taught by Lee, thus providing a means of producing an efficient light source, as discussed by Lee **(See Col. 1 lines 32-35).**

Considering Claim 20, Lee teaches the optical device of claim 19, wherein the component further comprises an intermediate layer between the substrate and the layer comprising the at least one photoluminescent carbon nanotube **(See Col. 4 line 4-35, Fig. 1 i.e. fig. 1 illustrates that an intermediate layer(element 200,300) between the substrate(element 100) and carbon nano-tubes (element 400)).**

Conclusions

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hibret A. Woldekidan whose telephone number is (571)270-5145. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on 5712723078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2613

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. A. W./
Examiner, Art Unit 2613

/Kenneth N Vanderpuye/
Supervisory Patent Examiner, Art Unit 2613